

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FRANK DANIEL EGITTO,
PAUL EUGENE LOGAN AND
LUIS JESUS MATIENZO

Appeal No. 2001-0106
Application 08/855,811

ON BRIEF

Before WILLIAM F. SMITH, McKELVEY and MOORE Administrative Patent Judges.

MOORE, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 1, 3, 5 through 8, and 10, all the claims pending in this application. Claims 2, 4, and 9 have been canceled.

REPRESENTATIVE CLAIM

Claims 1, 6, and 8, which are illustrative of the subject matter on appeal, read as follows:

1. A device comprising a metal substrate, an electrically-conductive adhesive bonded to said metal substrate, and a layer of a coupling agent selected from the group of organosilanes, organotitanates, and organozirconates between said substrate and said adhesive, said coupling agent comprising a material bonded to said metal and also reacted with said electrically conductive adhesive.
6. An electrical component comprising a metal substrate, a layer of coupling agent selected from the group of organosilanes, organotitanates, and organozirconates on said substrate, an adhesive bonded to said layer of coupling agent, and an electrically-conductive adherend bonded to said adhesive, said coupling agent comprising a material bonded to the metal of said substrate and also reacted with said adhesive.
8. A process for improving the electrical properties of the bond formed between a metal substrate and an electrically conductive adhesive, said process comprising applying to said substrate a coupling agent selected from the group of organosilanes, organotitanates, and organozirconates, prior to the application of said adhesive thereto, said coupling agent comprising a material capable of bonding to said metal and also capable of reacting with said adhesive, and applying a conductive adhesive to said coupling agent.

THE REFERENCES

In rejecting the appealed claims under obviousness-type double patenting, the Examiner relies on the following references:

Thomson (Thomson)	3,715,371	Feb. 6, 1973 (filed Nov. 16, 1971)
Pleuddemann (Pleuddemann)	3,956,353	May 11, 1976 (filed Jul. 15, 1974)
Hahn et al. (Hahn)	5,002,808	Mar. 26, 1991 (filed Feb. 8, 1989)

Iliou et al. (Iliou)	4,616,413	Oct. 14, 1986 (filed Jul. 9, 1985)
Bruder (Bruder)	4,502,903	Mar. 5, 1985 (filed Jun. 4, 1984)

In formulating our opinion, we rely upon the following additional newly cited references:

Stow (Stow)	4,568,602	Feb. 4, 1986 (filed Aug. 2, 1984)
Tollefson et al. (Tollefson)	4,569,877	Feb. 11, 1986 (filed Apr. 15, 1985).

THE REJECTIONS

Given the complex nature of the rejection noted at Page 7, lines 1-4, of the Examiner's Answer, we have organized the rejections below and expressly restated the rejections including the Hahn reference as an additional reference.

Rejection (A) Claims 1, 3, 5, 8 and 10 are rejected under 35 U.S.C. § 102(b) as anticipated by, and alternatively, under 35 U.S.C. § 103 as unpatentable over Thomson.

Rejection (B) Claims 1, 3, and 8 are rejected under 35 U.S.C. § 102(b) as anticipated by, and alternatively, under 35 U.S.C. § 103 as unpatentable over Pleuddemann or Hahn.

Rejection (C) Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson.

Rejection (D) Claim 6 is rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of either Pleuddemann or Hahn.

Rejection (E) Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson.

Rejection (F) Claims 1, 3, and 8 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of either Pleuddemann or Hahn.

Rejection (G) Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Thomson in view of Hahn.

Rejection (H) Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson further in view of Hahn.

Rejection (I) Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson further in view of Hahn.

SUMMARY OF DECISION

We reverse the §102/§103 rejections over the individually applied references (contained in Rejections A and B above), affirm the §103 rejections as stated in Rejections C, D, E, F, H, and I over the combinations of references, reverse the §103 rejection as stated in Rejection G over the combination of references, and make two new grounds of rejection (Rejection J and Rejection K) under 37 C.F.R. 1.196(b).

THE ISSUES

The core issues presented for review are:

- I) Whether the examiner erred in rejecting claims 1, 3, 5, 6, 7, 8, and 10 as unpatentable under 35 U.S.C. §102(b) or §103 over Thomson, Pleuddemann, or Hahn (each individually, as applied to the particular claims recited above).
- II) Whether the Examiner erred in rejecting claims 1, 3, 5, 6, 7, 8, and 10 as unpatentable under 35 U.S.C. §103 over the combinations of

Thomson, Pleuddemann, Hahn, Iliou, or Bruder, in the rejections as outlined above.

DELIBERATIONS

Our deliberations in this matter have included evaluation and review of the following materials:

- (1) the instant specification, including all of the claims on appeal;
 - (2) Appellant's Main Brief (Paper No. 17) and the Reply Brief (Paper No. 19);
 - (3) the Examiner's Answer (Paper No. 18);
 - (4) the above-cited prior art references (including two newly cited references);
- and
- (5) the application's prosecution history, including the Declarations of Frank Egitto (attached to Paper No. 13) and Steven Cain (Paper No. 14).

On consideration of the entire record, including the above-listed materials, we reverse in part, affirm in part, and make two new grounds of rejection.

DISCUSSION

The Invention

Appellants' invention relates to a technique for improving the electrical properties of the adhesive bond formed between a metal surface and an electrically conductive adhesive. The Appellants' utilize organic coupling agents (specifically organosilanes, organonitrates, and organozirconates) to treat the metal surface prior to the application of an electrically conductive adhesive to the surface, forming a layer. The claims of the

application recite a device, an electrical component, and a process for improving electrical properties of a bond.

Discussion

Issue I. The Rejections over Thomson, Pleuddemann and Hahn Individually

We address the single reference combined §102/§103 rejections first. In the Examiner's Answer, Page 4, lines 6-14, the Examiner states that:

Claims 1, 3, 5, 8 and 10 stand rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 USC 103 as being unpatentable over the teachings of the U.S. Patent to Thomson.

Thomson (U.S. 3,715,371) discloses that it is known to bond an inorganic (e.g. metal) substrate to any polymeric material via the interposition therebetween of an (e.g. amino containing) organosilane compound/coupling agent. (abstract, column 1, line 7 through column 2, line 59, column 4, line 14 through column 5, line 65). Any differences which might possibly/conceivably exist between this envisioned, claimed invention and the teachings of this reference do NOT constitute patentable differences. [Capitalization in original]

In response, the Appellants note that Thomson is “absolutely silent about bonding of an electrically-conductive adhesive to a metal substrate” (Appeal Brief, page 7, lines 2-3).

Turning now to the Pleuddemann and Hahn rejections, we note that the Examiner stated at page 4, line 18 – page 5, line 5 of the Examiner's Answer, that:

Plueddemann (U.S. 3,956,353-abstract, column 1, lines 23-56, column 2, lines 50-66, column 3, lines 16-23) and Hahn et al (U.S. 5,002,808- abstract, column 1, lines 16-48, column 3, lines 44-60, column 6, lines 41-49) both disclose that it is known to bond an inorganic (e.g. metal) substrate to any of a wide variety of polymeric materials via the interposition therebetween of an organosilane compound/coupling agent. The Examiners position is that any differences which might possibly/conceivably exist between this envisioned, claimed invention and the teachings of either of these references do not constitute patentable differences.

The Appellants position (Appeal Brief, page 11, lines 3-4) is that:

...neither Pluddeman [sic] nor Hahn et al teach or suggest a coupling agent interposed between a conductive adhesive and a substrate.

The Examiner on the other hand states on page 5, lines 6-12 of the Examiner's Answer, that:

Regarding both of the foregoing art rejections, the (conventional) polymeric materials disclosed in/employed by the three applied references are held/seen to (a) encompass within their scope and definition filled and/or conductive polymers i.e. those polymeric materials composed of a known base resin in conjunction with an (e.g. carbon, metal etc., conductive) filler; and (b) possess adhesive properties/functionality/capability in at least some instances.

After a searching review of Thomson, Pleuddemann, and Hahn, we are constrained to agree with the Appellants' interpretation of the references. First, we are unable to discern any teaching of an electrically conductive adhesive within the four corners of the Thomson document. Second, we cannot find a layer of coupling agent between an electrically conductive adhesive and a metal substrate in either Pleuddemann or Hahn. Although the scope of the Thomson, Pleuddemann and Hahn reference may indeed be generic to a conductive adhesive ("any polymer", Thomson, Col. 1, lines 18-19; "epoxy resins", Pleuddemann, Col. 3, lines 18-19; and "numerous polymeric systems" Hahn Col. 3, line 48), that is simply not an express or implied disclosure of a conductive adhesive. It appears that Hahn even suggests the opposite - that the polymers be used as "insulating and planarization layers for multilayer electronic devices" (Column 3, lines 57-58).

Anticipation under 35 U.S.C. Section 102(e) requires that "each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros., Inc. v. Union Oil Co., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). As this standard has not been met for the §102

rejections over Thomson, Pleuddemann and Hahn, and the Examiner has not pointed to the missing elements, the rejections of claims 1, 3, 5, 8, and 10 under 35 U.S.C. §102 over Thomson, Pleuddemann, and Hahn individually in Rejections A and B are reversed.

Turning now to the corresponding §103 rejections in Rejections A and B over Thomson, Pleuddemann, and Hahn, the Appellant states that:

The Examiner has also rejected claims 1, 5, 8, and 10 under 35 U.S.C. § 103(a) as being obvious over Thomson. Such a rejection is not understood since, as pointed out above, Thomson does not teach a conductive adhesive being used in conjunction with a coupling agent and a substrate for any reason, nor is there any reference that would suggest modifying Thomson to use a conductive adhesive for a purpose not disclosed in any reference. (Appeal Brief, page 7, lines 12-16).

and

The Examiner has further rejected claims 1, 3, and 8 as obvious over either Pluddemann [sic] or Hahn et al. Again, there is no suggestion in either of these references individually to modify or change the teaching of the coupling agent to promote adhesion between a nonconductive adhesive and a substrate to the use of a coupling agent not to improve adhesion but to improve electrical properties between a substrate and a conductive adhesive. There just is no suggestion in these references....(Appeal Brief, page 11, lines 8-13).

The Examiner has provided somewhat conclusory statements in support of the §103 rejections - "Any differences which might possibly/conceivably exist between this envisioned, claimed invention and the teachings of this reference do NOT constitute patentable differences" (Examiner's answer, page 4, lines 12-14, referring to Thomson) and "any differences which might possibly/conceivably exist between this envisioned, claimed invention and the teachings of either of these references do not constitute patentable differences" (Examiner's Answer, page 5, lines 3-5, referring to Pleuddemann and Hahn).

While the statements of the Examiner may be correct, we remain guided in our analysis by Section 103(a) of the patent statute, which provides as follows:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

35 U.S.C. Section 103(a) (1994).

In 1966, the Supreme Court in Graham v. John Deere Co., 383 U.S.1, 148 USPQ 459, 467 (1966) interpreted and applied section 103, stating:

Under 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

The Federal Circuit has determined that only after considering the four Graham criteria together can the decision maker make the legal determination of whether the invention is nonobvious. Panduit v. Dennison Manufacturing Co., 810 F.2d 1561, 1 USPQ2d 1593 (Fed. Cir.), cert denied, 481 U.S. 1052 (1987).

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field.); In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to

the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Most if not all inventions arise from a combination of old elements. See In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). When obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. See B.F. Goodrich Co. v. Aircraft Braking Sys. Corp., 72 F.3d 1577, 1582, 37 USPQ2d 1314, 1318 (Fed. Cir. 1996).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 U.S.P.Q. 871, 881 (CCPA 1981).

Whether the Examiner relies on an express or an implicit showing, he or she must provide particular findings related thereto. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. Broad conclusory statements standing alone are not "evidence." Id.

The statements of the Examiner, noted above with respect to the §103 rejections over Thomson, Pleuddemann, and Hahn individually, fall within the realm of “broad conclusory statements”, and provide us with no findings in support of the §103 rejection. Without a particularized finding along the lines of that suggested by Keller or W.M.S. Gaming as to why one of skill in the art would modify the references, we are constrained to reverse the §103 rejections over Thomson, Pleuddemann, and Hahn individually.

Issue II. The §103 Rejections over the Combinations of References

Turning now to the § 103 rejections based upon the combinations of references, we address them together in the following categories for ease of reference:

Category A Rejections.

(Rejection E) Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson.

(Rejection I) Claims 1, 3, 5, 8, and 10 are additionally rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson further in view of Hahn.

(Rejection F) Claims 1, 3, and 8 are separately rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of either Pleuddemann or Hahn.

Category B Rejections.

(Rejection G) Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Thomson in view of Hahn.

Category C Rejections.

(Rejection C) Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson.

(Rejection H) Claims 6 and 7 are further rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson further in view of Hahn.

(Rejection D) Claim 6 is individually rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of either Pleuddemann or Hahn.

Discussion of Category A Rejections

For the rejections in category A, the Examiner notes that:

Rejection (E)

Claims 1, 3, 5, 8 and 10 stand further rejected under 35 USC 103 as being unpatentable [over] the teachings of the U.S. Patents to Bruder in view of Thomson.

Bruder (U.S. 4,502,903) discloses that it is known to bond/adhere a conductive, adhesive, plastic layer to a metal substrate. (abstract, column 1, lines 41-55, column 3, line 66 through column 4, line 53). It would have been obvious to one of ordinary skill in this art to employ the aminosilane compound/coupling agent of Thomson for its documented, beneficial coupling and/or adhesion promoting function in/in [sic] conjunction with the process of Bruder. (Examiner's Answer, page 6, lines 11 – 15).

Rejection (I)

[The rejection is] repeated, with the addition of Hahn et al as a secondary reference Note that these patentees clearly disclose (N.B. column 1, lines 32-46) that organosilane compounds (i.e. coupling agents) are appreciated by this art to/by definition form a bond between an inorganic substrate and a polymer layer by interacting/reacting/coupling with both substrate and polymer. This reference is specifically applied primarily for the sake of exposition and completeness (Examiner's Answer, page 7, lines 1-8)(emphasis in original).

and

Rejection (F)

Claim 6 stands further rejected under 35 USC 103 as being unpatentable over the teachings of the U.S. Patents to Iliou et al in view of either Pleuddemann or Hahn et al.

The Examiner's position is that it would have been obvious to one of ordinary skill in the art to employ the silane compound/coupling agent of either

Pleuddemann or Hahn et al for their documented beneficial coupling and/or adhesion promoting function in/in [sic] conjunction with the process of Bruder. (Examiner's Answer, page 6, lines 9-15).

The Appellants, on the other hand, note the following:

As pointed out in the [Appeal] brief, it is true that Bruder does teach the use of a conductive adhesive agent against the metallic layer. However, Bruder does not suggest using a coupling agent. Moreover, it is true that Thomson does suggest using a coupling agent but, for the purpose of improving adhesion with respect to a nonconductive adhesive against a metal substrate. (Reply Brief, page 2, lines 15-19)

The Appellant goes on to dispute the prima facie case of obviousness, stating that the "reference performs a step for a different purpose and which does not recognize the problem solved by the applicants [prevention of electrical degradation over time]" (Reply Brief, page 2, lines 23-24). Further, the Appellants note, via the declarations of Egitto and Cain, that "the coupling agents do not improve the adhesion in a significant way between the electrically conductive adhesive and the metal substrate." (Reply Brief, page 2, lines 27-29)(Emphasis in Original).

The Appellants sum up their position at Reply Brief, page 3, lines 7-10, as follows:

[A]ll the prior art references which suggest the use of the coupling agent suggest it for the use in improving adhesion, which it does not do in the instant case, but none suggest it for improving the resistance to degradation of electrical properties over time, which it does do.

The Examiner disputes the Declaration conclusion, noting "that the conductive adhesive envisioned for use by appellants fractures internally (where no coupling agent/function is present is held/seen not to (necessarily) indicate that there is no adhesion improvement at the metal/conductive adhesive interface." (Examiner's Answer, page 8, lines 6-9).

Rejection E

Claims 1, 3, 5, 8 and 10 stand further rejected under 35 USC 103 as being unpatentable [over] the teachings of the U.S. Patents to Bruder in view of Thomson.

Bruder discloses the essential structure as claimed in claims 1, 6, and 8 (although this rejection for an unexplained reason is not applied against claim 6). At column 2, lines 5 – 33 the prior art conventional practice of manufacturing so-called “Leclanche cells” is outlined. Terminal current collectors are formed by laminating tinned steel or aluminum foil to a conductive plastic substrate. The statement at column 2, lines 13-17 is especially telling. “While it has been suggested that these metals can be laminated directly to the conductive plastic substrate, in practice this is not practical without the use of an intermediate conductive plastic adhesive.”

This disclosure unambiguously teaches the metal substrate of claims 1 and 8, and a conductive adhesive as required by claim 1 and 8). It does not expressly teach the layer of coupling agent recited in claims 1 and 8.

Thomson, however, teaches the identical coupling agent for use in metal-polymer applications to greatly improve adhesion (column 1, line 25 and column 2, lines 24 and 31-33) by coating (column 2, line 46) in various amounts (column 2, line 67) by spraying, brushing, or pouring (column 3, line 5).

The Examiner has taken the position that this established the prima facie case of obviousness (Examiner’s answer, page 6, lines 11 et seq.), and we agree. The Appellant, however, has pointed to unexpectedly superior results in the form of enhanced resistance to loss of conductivity:

However, improved resistance to electrical degradation is shown to be a fact and is disclosed in the application (Reply brief, page 3, lines 27 – 28).

The Appellants have also stated that, based upon the declarations of Egitto and Cain, that the claimed coupling agents “did not improve the adhesion in any statistically significant way between the electrically conductive adhesive and the metal substrate (Appeal Brief, page 9, lines 18 – 19).

The Examiner considered the declaration evidence and remained unpersuaded:

[T]hat the conductive adhesive envisioned for use by appellants fractures internally (where no coupling agent/function is present) is held/seen not to (necessarily) indicate that there is no adhesion improvement at the metal/conductive adhesive interface (where the coupling agent is present) (Examiner’s Answer, page 8, lines 6 – 9).

We agree with the examiner. It seems that paragraphs 4 and 5 of the declaration of Egitto clearly state that “the failure mechanism for all of the samples that were tested was within the conductive adhesive layer and not at the adhesive layer interface to either metal surface” (Egitto Declaration, page 2, paragraph No. 4, lines 2-4). Mr. Egitto then concludes that “he as a person skilled in the art would not be led to utilize a coupling agent for its known and intended purpose of improving adhesion, since the coupling agent improved adhesion at the interface surface between the adhesive and the metal substrate” Id., paragraph No. 5, lines 3-6).

This statement is totally different from the statement in the Appellants’ Brief, page 9, line 18-19 in which the Appellants assert “These declarations clearly indicate that the coupling agents did not improve the adhesion in any statistically significant way between the electrically conductive adhesive and the metal substrate (Appeal Brief, page 9, lines 18-19)(Emphasis added). Our interpretation of the declaration is similar to the Examiner’s. As the bond failed at another location (the weakest link, so to speak)

there simply is no probative evidence as to what happened at the interface between the adhesive and the metal substrate.

However, we do recognize that unexpected results may still provide a basis for a finding of nonobviousness and we turn now to consider the improved electrical properties asserted by the Appellants.

Figure 1 of the Application illustrates that the resistance markedly increases in a joint between a metal and a conductive adhesive, which joint has been cleaned with isopropyl alcohol only. The resistance is generally well above 1000 mOhms. Figure 2 illustrates a similar joint, further including a vapor blast cleaning to roughen the surfaces. The initial resistances were exceptional, but the resistance over the first 50 hours crept up significantly to a level of 1000 mOhms (excluding one sample). Figures 3 and 4, according to the invention, utilize a coating layer of organosilane, and achieve a stabilized resistance in the vicinity of 100 mOhms.

Indeed, these are superior results. But the question remains – are they unexpected and sufficient to overcome the rather strong prima facie case of obviousness? The Appellants assert that “there is nothing in the art that would suggest that these coupling agents would have any effect on electrical properties of the conductive adhesive bond” (Appeal Brief, page 9, lines 24 – 25). Further, it is stated that “[the coupling agents] do act in a way to prevent electrical degradation of properties over time, which the prior art does not suggest.” (Appeal Brief, page 10, lines 1-2) (Emphasis in Original).

The Examiner notes that it is his view that “the teachings of the references clearly suggest doing (and do) what appellants have done (i.e. WRT the use of an (organosilane) adhesion promoter/coupling agent between a metal substrate and a resin adhesive)” (Examiner’s Answer, page 8, lines 18-20). “[I]t is the sum total of the teachings of the applied combined references taken as a whole which is held/seen to render appellants invention obvious to one of ordinary skill in this art” (*Id.*, page 9, lines 6 – 8).

We agree with the Examiner. Although the Appellant has repeatedly stated in briefs that the prior art is devoid of teachings of electrical resistance improvement obtained by organosilanes, we are compelled to disagree. One of skill in the art should be familiar with coupling agents generally and their benefits; and that same hypothetical person of skill in the art would also recognize the importance of the statement at column 1, lines 32-38 of Hahn “By far the most prevalent and widely studied adhesion aids for increasing the adhesion of polymers to inorganic surfaces are the organosilanes (see, for example the comprehensive work on organosilanes in Pleuddemann, *Organic Coupling Agents*, Plenum Press, 233 Spring Street New York, N.Y. (1982).”

Further contributing to the hypothetical person of skill in the art’s knowledge are US Patents 4,568,602 (Stow) and 4,569,877 (Tollefson).

Stow utilizes an organosilane coupling agent (column 4, lines 41-42) to give bonds exhibiting high durability during prolonged exposure to high humidity (column 4, lines 36-37) which achieve a stable, low resistance bond for the length of time and under the operating conditions that are expected (column 1, lines 30-31) for electronic equipment electrical connections (column 1, lines 13-15). The preferred embodiment is

an electrically conductive stripe which is a layer of metal (column 2, lines 54-55) having a conductive adhesive on the stripe (column 2, lines 40-41). The bonds having the best durability are obtained when the adhesive has “an interacted functionally reactive organosilane coupling agent” (column 4, lines 48-49) contained in the adhesive. While this is not a clear teaching of the layers of claims 1 and 8, it in our view further renders the results obtained by the Appellants not unexpected, and we will sustain the Examiner’s rejection of claims 1 and 8 under §103 over Bruder in view of Thomson (Rejection E).

Rejection (I)

[The rejection is] repeated, with the addition of Hahn et al as a secondary reference Note that these patentees clearly disclose (N.B. column 1, lines 32-46) that organosilane compounds (i.e. coupling agents) are appreciated by this art to/by definition form a bond between an inorganic substrate and a polymer layer by interacting/reacting/coupling with both substrate and polymer. This reference is specifically applied primarily for the sake of exposition and completeness (Examiner’s Answer, page 7, lines 1-8)(Emphasis in Original).

For the same reasons as noted above for Rejection (E), and as Hahn is cumulative to Thomson, we sustain the Examiner’s rejection of claims 1 and 8 under §103 over Bruder in view of Thomson further in view of Hahn (Rejection I).

Rejection (F)

Claim 6 stands further rejected under 35 USC 103 as being unpatentable over the teachings of the U.S. Patents to Bruder in view of either Pleuddemann or Hahn et al.

The Examiner states that “it would have been obvious to one of ordinary skill in this art to employ the silane compound/coupling agent of either Pleuddemann or Hahn et al for their documented beneficial coupling and/or adhesion promoting function in/in

[sic] conjunction with the process of Bruder.” (Examiner’s Answer, page 6, lines 18 - 20).

In response, the appellants note that “The deficiencies of each of these references have been pointed out above and thus it is believed that they are allowable” (Appeal Brief, page 12, lines 2-4).

Claim 6 recites an electrical component comprising a metal substrate, a layer of a coupling agent on the substrate, an adhesive (not necessarily conductive) bonded to the layer of coupling agent, and an electrically conductive adherend. The coupling agent is bonded to the metal of the substrate and is also reacted with the adhesive.

Iliou discloses an electronic component having a rigid conductive plate (column 2, line 42) bonded to an electrically conductive epoxide adhesive film (column 2, lines 58-59) bonded to a flexible conductive plate (e.g. Duroid 6010 or Diclad 810 (column 2, lines 22-28). Pleuddemann discloses using the claimed organosilane coupling agents (column 1, line 25 et seq.) on inorganic substrates (including metals) (column 2, lines 58-66) and epoxy resins (column 3, lines 18-19).

This is also a strong prima facie case of obviousness, and the Examiner has remained unpersuaded by the resistivity stability results put forth by the Appellants. For the reasons previously recited, we find no error in the Examiner’s maintaining this rejection, and affirm Rejection F.

Discussion of Category B Rejection

Rejection (G)

Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Thomson in view of Hahn

This rejection is argued by the Examiner as follows:

Thomson (U.S. 3,715,371) discloses that it is known to bond an inorganic (e.g. metal) substrate to any polymeric material via the interposition therebetween of an (e.g. amino containing) organosilane compound/coupling agent. (abstract, column 1, line 7 through column 2, line 59, column 4, line 14 through column 5, line 65). (Examiner's Answer, page 4, lines 9-12)

[Hahn clearly discloses] (N.B. column 1, lines 32-46) that organosilane compounds (i.e. coupling agents) are appreciated by this art to/by definition form a bond between an inorganic substrate and a polymer layer by interacting/reacting/coupling with both substrate and polymer. (Examiner's Answer, page 7, lines 4-8).

The Appellant notes that:

[T]he Thomson and Hahn et al patents do not teach the use of a coupling agent for any purpose with respect to conductive adhesive and teach a coupling agent for use in conjunction with a nonconducting adhesive only to increase adhesion. There is nothing in either Thomson or Hahn et al that suggests that there would be any improvement in the degradation of electrical properties over a period of time when a coupling agent is used in conjunction with a conductive adhesive." (Appeal Brief, page 9, lines 9-13).

As noted above, we agree with the Examiner that Thomson teaches the identically claimed coupling agent for use in metal-polymer applications to greatly improve adhesion (column 1, line 25 and column 2, lines 24 and 31-33) by coating (column 2, line 46) in various amounts (column 2, line 67) by spraying, brushing, or pouring (column 3, line 5).

Hahn, on the other hand, also discloses an organosilane coupling agent (column 1, lines 32-48) for bonding inorganic surfaces including metal (column 6, line 41-46) with polymers (column 2, lines 32-34).

However, neither reference discusses electrically conductive polymers. The Examiner has failed to explain why one of skill in the art would modify the combination of Thomson and Hahn to include conductive polymers.

As noted above, without the required particularized finding along the lines of that suggested by Keller or W.M.S. Gaming as to why one of skill in the art would modify the references, we are constrained to reverse the §103 rejection over Thomson in view of Hahn (Rejection G).

Discussion of Category C Rejections

Rejection C

Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson.

In support of this rejection, the Examiner notes the following:

Iliou et al (U.S. 4,616,413 – cited and supplied by appellants) disclose a basic element of the type envisioned and claimed viz. composed of a metallic substrate adhered to a conductive substrate via the intermediary of a conductive adhesive. (Figure 1, abstract, column 2, lines 22-60). The Examiner's position is that it would have been obvious to one of ordinary skill in this art to employ the aminosilane compound/coupling agent of Thomson for its documented beneficial coupling and/or adhesion promoting function in/in [sic] conjunction with the invention of Iliou et al. (Examiner's Answer, page 5, line 15 – page 6, line 2).

In response, the Appellant does not dispute the interpretations of Iliou and Thomson, but instead notes:

It is submitted that this [combination] points out exactly the deficiency of combining these references. If one were to employ the coupling agent of Thomson, one would expect an improvement in adhesion. Such improvement is not obtained. Moreover, there is nothing in Thomson at all that would lead one to believe that there would be an increase in any electrical properties, much less an improvement in electrical degradation over a period of time. Thus, clearly, since there is no suggestion of such a combination and that any combination would, according to any suggestion, result in an increased adhesion which does not happen and something that is not suggested does happen, indicates the unobviousness. (Appeal Brief, page 12, line 24 – page 13, line 3).

As discussed above, the Examiner has considered and was not persuaded by the declaratory evidence presented by Appellants relating to bond strength. We have also reviewed the declarations and find them deficient as previously discussed. Further,

in view of the knowledge of one of skill in the art of this commonly used coupling agent (including the Tollefson and Stow patents), we find the evidence of improved electrical properties insufficient to overcome the strong prima facie case of obviousness established by the Examiner.

Rejection C is therefore sustained.

Rejection H

Claims 6 and 7 are further rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson further in view of Hahn.

As Hahn is cumulative to Thomson, i.e. it discloses an organosilane coupling agent (column 1, lines 32-48) for bonding inorganic surfaces including metal (column 6, line 41-46) with polymers (column 2, lines 32-34), we sustain this rejection for the same reasons. Rejection H is sustained.

Rejection D

Claim 6 stands further rejected under 35 USC 103 as being unpatentable over the teachings of the U.S. Patents to Iliou et al in view of Either Plueddemann or Hahn et al.

In support of this rejection, the Examiner notes that:

[I]t would have been obvious to one of ordinary skill in this art to employ the silane compound/coupling agent of either Plueddemann or Hahn et al for their documented beneficial coupling and/or adhesion promoting function in/in [sic] conjunction with the invention of Iliou et al. (Examiner's Answer, page 6, lines 5-8).

The Appellant states that "Plueddemann and Hahn et al disclose increasing adhesion and indicate no relationship effect on electrical properties." (Appeal Brief, page 13, lines 6-8).

We note that Bruder discloses the essential structure as claimed in claim 6. At column 2, lines 5 – 33 the prior art conventional practice of manufacturing so-called

“Leclanche cells” is outlined. Terminal current collectors are formed by laminating tinned steel or aluminum foil to a conductive plastic substrate. The statement at column 2, lines 13-17, is especially telling. “While it has been suggested that these metals can be laminated directly to the conductive plastic substrate, in practice this is not practical without the use of an intermediate conductive plastic adhesive.”

As noted above, this disclosure unambiguously teaches the metal substrate, a conductive adhesive, and a conductive adherend as required by claim 6. It does not, however, teach the layer of coupling agent recited in claim 6. The Examiner turns to the Pleuddemann and Hahn references to establish the obviousness of this modification.

Pleuddemann discloses using the claimed organosilane coupling agents (column 1, line 25 et seq.) on inorganic substrates (including metals) (column 2, lines 58-66) and epoxy resins (column 3, lines 18-19). Hahn discloses an organosilane coupling agent (column 1, lines 32-48) for bonding inorganic surfaces including metal (column 6, line 41-46) with polymers (column 2, lines 32-34).

Again, the Examiner has remained unpersuaded by the resistivity stability results put forth by the Appellants. For the reasons previously recited, we find no error in the Examiner’s maintaining this rejection, and affirm Rejection D.

NEW GROUNDS OF REJECTION

We enter new grounds of rejection under the provisions of 37 C.F.R. § 1.196(b).

Rejection J

Claims 1, 3, 6, 7 and 8 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over the teachings of U.S. Patent 4,569,877 to Tollefson and U.S. Patent 4,568,602 to Stow individually.

Claim 1 of the instant application recites a device comprising a metal substrate, an electrically conductive adhesive bonded to the metal substrate, and a layer of coupling agent (organosilane, organonitrate, or organozirconate) between the substrate and adhesive. The coupling agent is bonded to the metal and to the electrically conductive adhesive.

Claim 3 requires the layer to be 100 Angstroms or less.

Claim 6 recites an electrical component comprising a metal substrate, a layer of a coupling agent (organosilane, organonitrate, or organozirconate) on the substrate, an adhesive (not necessarily conductive) bonded to the layer of coupling agent, and an electrically conductive adherend. The coupling agent is bonded to the metal of the substrate and is also reacted with the adhesive.

Claim 7 requires an additional layer of coupling agent between the adhesive and the adherend.

Claim 10 recites a process for improving electrical properties of a bond, comprising applying a coupling agent (organosilane, organonitrate, or organozirconate) to a metal substrate, and applying a conductive adhesive. The coupling agent material must be capable of bonding with the metal and reacting with the adhesive.

Tollefson discloses at least:

- (1) a metal electrically conductive stripe (column 3, lines 14 et seq.)
- (2) a conductive adhesive material applied to the metal stripe (column 4, lines 31-36)
- (3) the adhesive contains an interacted functionally reactive organosilane coupling agent (column 4, lines 47-49)

(4) electrical connections can be made by adhering an end of the tape against a set of terminal pads, with individual stripes on the tape in alignment with individual pads (column 1, lines 19-22).

(5) adhesive layer thicknesses can be from 25 to 550 micrometers (column 5, lines 49-50)

Stow discloses at least:

(1) electrically conductive stripes (column 2, line 40)

(2) a layer of conductive adhesive (column 2, lines 40-42)

(3) an interacted functionally reactive organosilane coupling agent (column 4, lines 40-41)

(4) electrical connections by adhering an end of the tape against a set of terminal pads, with the individual stripes on the tape in alignment with the individual pads (column 1, lines 24-27)

(5) adhesive layer thicknesses can be from 25 to 550 micrometers (column 5, lines 34-35)

It would have been obvious to one of skill in the art at the time the invention was made to modify the teachings of Tollefson and Stow to apply the organosilane as a single or double coupling layer instead of as a copolymer, as it is well known that coupling layers can be pre-applied (see, e.g. the teachings of Thomson, column 2, line 67 – column 3, line 8; Pleuddemann, column 2, lines 50-57). Claims 1 and 10 are therefore obvious. Claim 6 requires an electrically conductive adherend, which is satisfied by the teaching of adhering terminal pads through the adhesive conductive layer. Claim 6 is therefore obvious. Claim 7 requires an additional layer. The Tollefson

and Stow references have functional organosilanes at each adhesive-substrate bond by virtue of being in an interpolymer with the adhesive. Merely moving the organosilane to each boundary, as is conventional, is an obvious modification to one of skill in the art.

Claim 3 requires a layer of 100 Angstroms or less. However, the instant specification states that "The amount of adhesion promoter to be applied to the metal substrate is not critical and can vary widely" (Specification, Page 8, lines 27-29).

Although the specification suggests a layer less than 100 or 50 Angstroms may give better results, these thicknesses are obvious for adhesive-type applications (Stow, column 5, line 34 (25 – 550 micrometers); Tollefson, column 5, line 50-51 (6 to 450 micrometers)). Further, both the instant specification and Thomson suggest applying the coupling agent by the same means (spraying ... or dipping - Specification, page 8, lines 14-15); (sprayed, brushed, or poured over the surface of the material.

Alternatively, the material or substrate can be dipped...- Thomson, column 3, lines 5-8).

We have considered the declarations submitted (Egitto and Cain) as well as Examples 1-4 of the instant specification. The results are neither unexpected nor unusual, in light of the teachings of Tollefson.

Rejection K

Claims 5, and 10 are rejected under 35 U.S.C. § 103(b) as obvious over Tollefson and Stow, each individually in view of Thomson.

Claims 5 and 10 require that the coupling agent be an amine-terminated silane or an epoxy –terminated silane.

Tollefson and Shaw are applied as above. Thomson discloses an amine terminated silane. (column 1, lines 25-28).

It would have been obvious to modify the teachings of Stow and Tollefson to utilize and amine-terminated silane layer of coupling agent.

Summary of Decision

Rejection (A), stating that Claims 1, 3, 5, 8 and 10 are rejected under 35 U.S.C. § 102(b) as anticipated by, and alternatively, under 35 U.S.C. § 103 as unpatentable over Thomson is reversed.

Rejection (B), stating that Claims 1, 3, and 8 are rejected under 35 U.S.C. § 102(b) as anticipated by, and alternatively, under 35 U.S.C. § 103 as unpatentable over Pleuddemann or Hahn is reversed.

Rejection (C), stating that Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson is affirmed.

Rejection (D), stating that Claim 6 is rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of either Pleuddemann or Hahn is affirmed.

Rejection (E), stating that Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson is affirmed.

Rejection (F), stating that Claims 1, 3, and 8 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of either Pleuddemann or Hahn is affirmed.

Rejection (G), stating that Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Thomson in view of Hahn is reversed.

Rejection (H), stating that Claims 6 and 7 are rejected under 35 U.S.C. § 103 as unpatentable over Iliou in view of Thomson further in view of Hahn is affirmed.

Rejection (I), stating that Claims 1, 3, 5, 8, and 10 are rejected under 35 U.S.C. § 103 as unpatentable over Bruder in view of Thomson further in view of Hahn, is affirmed.

Rejection (J), newly applied, states that Claims 1, 3, 6, 7 and 8 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over the teachings of U.S. Patent 4,569,877 to Tollefson and U.S. Patent 4,568,602 to Stow individually.

Rejection (K), newly applied, states that Claims 5, and 10 are rejected under 35 U.S.C. § 103(b) as obvious over Tollefson and Shaw, each individually in view of Thomson.

Time Period for Response

This opinion contains a new ground of rejection pursuant to 37 C.F.R. § 1.196(b). A decision which includes a new ground of rejection shall not be considered final for purposes of judicial review.

The patent owner, within TWO MONTHS of the date of this decision, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of proceedings as to the rejected claims:

- (1) Submit an appropriate amendment to the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner
- (2) Request that the application be reheard on the same record.

No time period for taking any subsequent action in connection with this appeal
may be extended under 37 C.F.R. 1.136(a).

AFFIRMED

WILLIAM F. SMITH
Administrative Patent Judge

BRADLEY R. GARRIS
Administrative Patent Judge

JAMES T. MOORE
Administrative Patent Judge

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Appeal No. 2001-0106
Application 08/855,811

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